

ON THE LIFE-HISTORY OF DIABROTICA 12-PUNCTATA OLIV.

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This insect is deserving of especial attention just now because it appears to be undergoing a change of habit similar to those undergone in the past by several other native American insects, and probably due to the destruction, by the cultivation of land and by grazing, of the wild plants upon which it has hitherto subsisted. This explanation of its sudden appearance recently over a wide extent of territory as a corn-infesting insect seems to me the only one warranted by the published facts of its history.

Until 1888 *Diabrotica 12-punctata* did not appear in the literature of economic entomology as an important enemy of any of our staple crops. Mr. B. D. Walsh, writing in 1866 (*Pract. ent.*, v. 1, 110) and referring to the beetle, states that "it is very injurious to flowers especially to Dablias," and infers that it is in part responsible for an injury to the leaves of melons, cucumbers and other plants, of which one of his correspondents complains.

In 1868 Walsh and Riley (*Am. ent.* v. 1, 227) in reply to a correspondent in Bushberg, Missouri, wrote of the same beetle, "The yellow beetle with twelve black spots which we herewith illustrate (Fig. 168, twice natural size) and which has been so destructive to your water melons and Hubbard squashes, is the 12-spotted *Diabrotica*." In the same

place in reply to R. D. Parker of Manhattan, Kansas, these authors state that insects sent to them for determination are also *D. 12-punctata*.

In 1870 Prof. C. V. Riley (2d Missouri Report, 66) wrote that the beetle "may often be found embedded in the rind of both melons, cucumbers and squashes," a statement which is repeated in 1872 by Mr. E. B. Reed (*Ent. soc. Ont.*, Report for 1871, 91).

Prof. S. A. Forbes somewhat extends the knowledge of the food-habits of the beetle by recording in his first report as State Entomologist of Illinois (p. 104) that it was observed Aug. 1, 1882, feeding on the pollen of corn and on the blossoms of clover.

One of the most notable cases of injury by the beetle is that reported in 1888 by the editors of *Insect life* (v. 1, 58). In an orchard at Hernden, Virginia, planted chiefly in 1887, young apricot and plum trees are stated to have been badly injured in late April and early May by the beetles, which devoured the leaves as they unfolded. The land on which the trees were planted was mostly in corn in 1887, but a half acre had been in melons. In concluding their notice the authors use the following words:

"It is safe to say, however, that this occurrence is exceptional, and that it depended almost entirely upon the peculiar circum-

stance of a young orchard having been planted close to a last year's melon patch, which was not replanted this year. The beetles undoubtedly bred upon the melons last season and hibernated in large numbers. The present spring, finding no more appropriate food at hand they took to the young plums and apricots merely as a substitute. We have little fear, therefore, that a new habit has been formed."

What basis the authors had for the positive statement that the beetles bred upon the melons I am unable to say, but it is more than probable from what is now known of the life-history of the insect that many of the beetles had developed instead on the roots of the corn.

These references and quotations will serve my purpose of presenting the insect as it was known to entomologists during the time which they cover. It is to be noticed that no reference is made to the larva except that implied in the statement made by the editors of *Insect life* to the effect that the beetles breed upon melons. If these authors had known at the time their notice was written that larval *Diabrotica 12-punctata* feed on the roots of corn we may assume that they would have mentioned it in reporting a case in which the relation between the injury to the trees and the corn-infesting habit is so evident.

During the years 1882 and 1883 Prof. S. A. Forbes made a thorough study of the related *D. longicornis*, which affects the roots of corn in Illinois and other middle states. In this region *D. 12-punctata* is a very common species, occurring everywhere in gardens and

fields on flowers. With the thorough examination of insects from the roots of corn which to my knowledge was made by him, it is altogether unlikely that it would have escaped notice if its larvae had then been present in any numbers in corn fields.

In the report for 1887 (published in 1888) of the *Entomologist* of the National Department of Agriculture, Mr. F. M. Webster states in a brief notice that while in Louisiana in 1886:

"We frequently heard of fields of young corn being seriously injured, during some seasons, by a small white worm which attacked the roots, usually during April. From the description given us of the pest and its manner of attacking the plants, we first thought it might be the larva of *D. longicornis*, as the habitat of that species is known to extend southward to Central America. On April 12 of the present year [1887] we were enabled to solve the problem by finding considerable numbers of these larvae in a field of corn in Tensas Parish, La., where they were working considerable mischief by killing the young plants. As observed by us, their mode of attack differed from that of their northern congener in that they did not appear to attack the fibrous roots or bury themselves in longitudinal channels excavated in the larger roots. On the contrary, they burrowed directly into the plants at or near the upper whorl of roots, which almost invariably resulted in the death of the plant. . . . Both of these fields had produced cotton the preceding year. The adult beetles were frequently seen before we observed the larvae, but they were not abundant about the plants in the corn fields, being usually on the yellow blossoms of a species of *Aster* which springs up in cultivated grounds early in the spring in great abundance. No pupae were found, although careful search was made for them."

The above is the earliest notice of *D. 12-punctata* as a corn insect of importance which I have seen. Unfortunately the writer does not state whether his conclusion as to the author of the injury was the result of inference, or was arrived at by carrying the larvae through their transformations. From the fact that he had not found pupae up to the time of writing, it is proper to assume that the transformations were not observed. As a possible clue to one of the original food-plants of the larva attention is directed to the fact that he found the beetles abundant on an Aster growing on cultivated ground. (From its yellow color the plant would appear to belong to some other genus.) If, as is not unlikely from an observation made by Prof. Luggar and reported farther on, the plants observed by Mr. Webster are attacked by the larvae, the fact may have an important economic bearing.

During the years 1889 and 1890 the injury from larvae to corn attracted attention over a wide area of country. To my knowledge it has been witnessed in Virginia, Alabama, Mississippi, Louisiana, Arkansas, Kentucky, Illinois, Indiana and Ohio.

My own observations began July 15, 1889, and have continued, as other work permitted, to the present time. A brief notice of the insect, its habits and stages, was printed in the Louisville Home and Farm, Sep. 1, 1889, and in November of the same year was followed by a more elaborate account of the transformations and descriptions of the stages, presented before a meeting of the Association of official economic entomologists at Washington. (See *Insect life*, v. 2, 179.) The latter paper is embodied in what follows, with the addition of observations made during the winter of 1889-90, and the spring of 1890.

(*To be continued.*)

THE PARTIAL PREPARATORY STAGES OF HETEROPACHA RILEYANA HARVEY.

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In 1887 I found larvae of this species feeding on the honey locust in two stages of their growth. At the time I was feeding quite a number of other larvae and did not make so full notes of these as could be desired, but what I did make are as follows:

Length, .45 inch. The body flattened beneath, the back rounded, head small, a fringe of white hairs on each side of the body. Color

reddish brown with an indistinct dorsal stripe of a more distinct red, a stigmal blackish stripe; head black, with a longitudinal fulvous line each side of the middle and a transverse line of the same about the middle of the front.

Next to last stage:—Length at moult .60 inch. Shape as in the preceding. Brownish red on the dorsum, but joints 8 and 9 gray on the sides leaving only a narrow dorsal brownish red stripe; joint 6 gray but less distinct.